meridian, and by laying off the predetermined data on this projection—which is illustrated in the description—the observer may quickly find the required quantities.

The editor of the *Review*, Prof. Cleveland Abbe, commends Mr. Littlehales's method to the attention of all who have occasion to solve spherical triangles to the nearest minute of arc, whether in geodesy, navigation, astronomy, or general mathematical work.

THE METEORS OF BIELA'S COMET.—In No. 363 of the *Observatory* Mr. Denning directs attention to the probability of a strong shower of Andromedids this year. By quoting the observational results obtained during recent years, he shows that the shower has apparently developed into an important annual phenomenon, and he expects that the maximum display will take place on November 18, although a watch should be kept from November 17 to November 23. The position of the radiant is about R.A. $=25°$, dec. $=+43°$, *i.e.* near to γ Andromedæ.

THE MAGNITUDE OF η ARGÛS.—From a series of observations made at Johannesburg during May and June, Mr. R. T. A. Innes found the magnitude of η Argûs for 1905·5 to be 7·67, and its colour, on Chandler's scale, to be 7½. On comparing these with the observations made in 1896, he finds that the change, if any, since that date is quite insignificant (*Monthly Notices R.A.S.*, No. 9, vol. lxv.).

ENGINEERING AT THE BRITISH ASSOCIATION.

BEFORE dealing with the actual work of the section, it is desirable to put on record the fact that several of the special lectures arranged by the council were exclusively engineering in their character, namely, the lectures delivered at Johannesburg by Prof. Ayrton on the distribution of power, and by Prof. Arnold on steel as an igneous rock, and the address given at Kimberley by Prof. Porter on the bearing of engineering on mining. In judging, therefore, the work done by Section G during the South African meeting, the effect produced by these lectures, delivered in all cases to large audiences, must be kept in mind.

At Cape Town the first paper read was by Mr. C. H. Smith, on colonial Dutch architecture. In this paper Mr. Smith gave a brief account of the history and development of the early architecture of Cape Colony. He pointed out that building materials were exceedingly difficult to obtain, but in spite of all difficulties the early Dutch settlers, who were men of excellent taste and education, commenced their labours on true lines. Although drawing upon the well known principles of Dutch and Batavian architecture, they adapted their buildings to the new country, and developed a style distinctly their own. It was to Governor Simon van der Stel that many of the most picturesque houses in the Cape Peninsula were due. He and his son, who succeeded him, were great builders of houses and planters of trees. The author showed a number of slides illustrating some of the quaint old houses in the Cape Peninsula and its neighbourhood, in particular at Stellenbosch, famous for its beautiful situation and surroundings. This paper proved a great attraction, and drew a large audience.

The paper by Prof. Biles, on steam turbines as applied to ocean liners, was the next dealt with. When this paper was first promised, the author hoped that detailed results of the running of the only two completed turbine ocean steamers would have been available for his paper; unfortunately this was not the case, though Prof. Biles stated that the results so far obtained had completely justified the adoption of the turbine on ocean steamers. He pointed out that such a great revolution as a change from reciprocating engines to turbine engines had never before taken place in such a short time. The author gave figures dealing with the gain in economy from an engineering point of view; in the case of the turbine steamers the *Londonderry* and the *Manxman*, as compared with the *Antrim* and the *Donegal*, designed at the same time, and having reciprocating engines, the *Londonderry* showed a total economy of 2·4 per cent. and the *Manxman* of 7·7 per cent. Prof. Biles, in summing up the work which had been done so far, stated that he was of opinion that there was every indication that in the largest installations on ocean liners there was an economy of power and cost in the use of turbines as well assured as in the case of channel steamers, and that there was little doubt that the turbine would completely displace the reciprocating engine in all moderate and high-speed liners.

Mr. How, in his paper on roller bearings, which was read in his absence by the Recorder of the section, gave some results of recent tests on line shafting when fitted with roller bearings, and on tramway and railway vehicles. In the Birmingham electric tramways it was stated that a saving of 24·3 per cent. of tractive power per ton of load was obtained, and that the net saving per car per annum would amount to 38*l*. 16*s*. 3*d*. Several railway companies had experimented with roller bearings, and in all cases a considerable economy in coal consumption had resulted. On the Liverpool overhead railway, tests proved that the reduction per ton mile of coal consumption was equal to 9 per cent., and that longer trains could be employed.

A very interesting paper was that on motor-cars in South Africa, by Mr. A. T. Hennessey. The chief object of the author was to make clear the special points in car design and construction to which attention should be paid if the motor-car is to be a success in South Africa. So far, of course, all the cars in use there are imported cars, and are built for conditions which prevail in Europe and America, and not for the conditions which prevail in South Africa. In comparing steam cars with petrol cars, Mr. Hennessey came to the conclusion that the latter were the more suitable for South African conditions; in fact, he was of opinion that the shortcomings and disabilities of the steam car were greatly accentuated by the climatic and road conditions of South Africa. The question of the cooling of the cylinders in a semi-tropical country, with roads carried up very steep hills, is most important, and very few imported cars have anything like enough water-cooling capacity. As regards springs, also, there has been great difficulty, and motorists at home have very little idea as to the strain placed upon the springs by the ordinary South African roads. In a motor-car excursion, arranged for the visiting members of the association on the Saturday of the Cape meeting, along the beautiful coast road which runs from Cape Town to Hout Bay, owing to a landslip on the mountain-side, caused by the heavy rains of July and August, the visitors had an ample opportunity of testing the kind of strain to which motor-cars are subjected in South Africa; the cars had to charge through a mass of liquid mud and stones, probably 12 inches in depth, and extending for some 100 yards along the road. In many country districts the author pointed out that it is a common occurrence for the centre of the track to be from 6 inches to 12 inches higher than the sides, which would render it impossible for a car with only a 5-inch under-clearance, which is the maximum clearance of many cars, to travel over these country roads. This paper provoked a very interesting discussion, in which the claims of the steam car were strongly upheld by one or two of the speakers.

The most important paper read before the section in Cape Town was Mr. Tippett's, on Cape Government railways. The author is one of the leading engineers in the Cape Government Railway Service, and the Government gave him every facility in the preparation of his paper. The paper formed practically a complete record of the growth of the railway industry in Cape Colony, and of the methods adopted in surveying, in constructing, and in working the railways. It bristled with statistics and figures, and there were a number of excellent diagrams and reproductions of photographs to illustrate the paper. It will form a most valuable paper for reference purposes to anyone engaged in studying the conditions of railway construction and working in our South African colonies. It is obviously impossible to give anything but a very faint notion of the contents of a paper of such length and importance in a brief summary, such as this is, of the proceedings of the section. One or two salient points to which the author devoted much attention may, however, be briefly dealt with. The one is the question of gauge. He pointed out that the original line from Cape Town to Wellington, now part of the main western system, which was constructed by a private company, was built on the 4 feet 8½ inch gauge, but when the Government took over this line, and decided to take in its own hands the construction of the railways, acting on the advice of a strong commission, it decided to adopt 3 feet 6 inches as the standard gauge. That gauge has been adhered to throughout South Africa with the exception of one or two short branch lines, which are on the 2-feet gauge, and at the present time a 2-feet gauge line is in process of construction between Port Elizabeth and Avontuur, a coast line, which will probably be eventually extended to Cape Town. The wisdom of constructing a line such as this on a 2-feet gauge seems rather doubtful, but the large bridges on it have been put up of such a strength and of such dimensions as would enable a 3 feet 6 inches gauge to be adopted later on. Another point on which the author laid great emphasis was the system of surveying which it was necessary to adopt in a country where Ordnance maps are at present unavailable. The colonial-trained surveyors are able to carry out work with rapidity and with accuracy by the use of the tacheometer only, which would be impossible in the hands of surveyors trained only in our home methods. If a country like South Africa is to be developed by railways, it is obvious that the cost of construction must be kept down to the lowest possible figure, and, therefore, tunnels, heavy cuttings, and heavy banks must be avoided. All the members of the visiting party who travelled over the main lines in all the colonies during the visit of the association were struck with the extraordinary surface character and curvilinear meanderings of the railway lines, although by this system of construction the actual length of the lines has been in many cases increased, and the possible speed at which trains can be worked has been lessened; nevertheless, when one compares travelling, both as regards time and cost, on these lines with that in the old days with ox or mule waggons, there is no doubt that the wisest plan was to sacrifice, for the time being, possible speed for economy in construction. The Cape lines, and in fact all the lines which serve the Transvaal, suffer from the same disability as the steamer lines which ply between Europe and the Cape—heavy goods traffic is all in one direction. No less than 80 per cent. of the goods traffic on the Cape Government railways is in the shape of up-country traffic; this means necessarily a large number of empty waggons returning to the coast, and must inevitably increase freight charges.

The section opened its proceedings at Johannesburg with the president's address, which was devoted to irrigation. The subject is one of such paramount importance to South Africa that no happier choice could have been made of a president for Section G than that of Sir Colin Scott-Moncrieff. Naturally the examples selected by the president for illustration of the problem of irrigation for agricultural purposes were India and Egypt, although he had also a good deal to say with regard to the system in force in the United States and in Italy. It is to be hoped that the information placed at the disposal of South African engineers by this address will not fail to influence the trend of legislation on this question in our South African colonies.

Sir William Preece gave an interesting account of the present condition of wireless telegraphy, and his paper, bringing all the information on this question up to the most recent date, was a welcome contribution to the transactions of the section. Sir William Preece has on previous occasions contributed papers on this question to the section, and has kept the section well informed of the gradual progress in the evolution of wireless telegraphy as a practical mode of communication.

Prof. Perry's paper on the accidental breakage of winding ropes in mines concluded the first day's work at Johannesburg. In this paper certain examples were worked out in full, and in an appendix to the paper the whole of the mathematical treatment of the problem was given by the author.

The second day's proceedings were opened by Mr. Hammond with a paper on electrical power distribution for the Rand. After alluding briefly to the present tendency at home, and at such situations as the Niagara Falls, to construct large central supply stations, the author referred to the fact that he was surprised to find that this problem had not yet been taken up on the Witwatersrand. Two points were, therefore, discussed in the paper—one was whether the working of the mines could not be cheapened by the extended application of electrical power, and the second, as a corollary, whether such electrical power could not be more economically produced by a central station rather than by each mine, or group of mines, laying down its own plant. In colliery work in Great Britain there is, and has been for the last year or two, a steady growth in the application of electricity to haulage and other work in the coal mines, and the author advocated the adoption of electrical winding for the Rand mines. He also pointed out that a considerable increase of efficiency would be obtained by the abolition of the surface compressed-air plant, and by the introduction of electrically driven compressors, placed underground near the actual workings. Mr. Hammond showed that the total requirements of the Rand mines worked out at a very high figure of horse-power hours (400,000,000), and he proved by further figures that a central power station would thus have a very favourable load factor. Assuming a diversity factor of 60 per cent., and a 20 per cent. loss in distribution and transformation, he estimated the plant capacity at the central station would be 60,000 kilowatts. Basing his further calculations on these figures, the author then proceeded to work out fully the costs of generation and distribution, the revenue which could be expected, and the corresponding financial results. In concluding his communication, which was one of great value, Mr. Hammond referred to the case of the well known central power station at Newcastle-upon-Tyne, and expressed the opinion that if on the river Tyne, where coal was available in large quantities at very low rates, it paid to displace steam power by electric power, still more so would it pay on the Rand.

Mr. Dew read a short paper on water-power plants, Pilgrim's Rest, Transvaal. In this paper the author gave a list of plants in actual operation with the horse-power developed, the type of prime mover, quantity of water, and head, and dealt with a number of points of special interest in the running of such plants.

On the Friday, the last day the section met, the first paper was by Mr. C. W. Methven, on South African harbours. This paper was one of great importance, and must have involved an immense amount of work in its preparation. Practically a complete history of the harbours which have been built up round the South African coast was given. As the author pointed out, there is a remarkable absence of deep-water indentations forming natural harbours between Cape Town and Delagoa Bay, and therefore all the harbours have had to be artificially created. After giving a brief account of the Table Bay works, and the extensions now being carried out by Mr. Hammersley Heenan, the author referred to the Algoa Bay works, and the remarkable stride which had been made within the last few years in the commercial prosperity of this harbour, in spite of the difficulties due to its exposed condition and the heavy seas which frequently make approach almost impossible. Mr. Methven then discussed very fully the formation and treatment of sand-bars at the mouths of the rivers and lagoons on the south-east African coast, which render the construction of harbours and their maintenance such a difficult engineering problem.

Another valuable paper taken at this sitting was one by Mr. C. D. H. Braine, on irrigation in South Africa, dealing with the important question of the duty of water used for irrigation purposes. The author stated that there was very little information on the subject as regards South African practice, and that therefore irrigation engineers in South Africa had to be guided to a great extent by experience in other countries, such as America, Spain, India, &c. He pointed out how unskilled irrigation frequently means a waste of from 25 per cent. to 50 per cent. of water, and that many crops were actually impaired by excessive irrigation. For South Africa he was of opinion that the duty actually used on the land could be safely taken at the rate of 285 acres per cubic foot of water per second, and he quoted statistics from other countries to show that this was a reasonable allowance. To show the value of irrigation in South Africa, the author gave figures as to increase in land values;

land valued in the dry, unirrigated state at anything from 10*s.* to 30*s.* per acre was valued at rates of from 25*l.* to 100*l.* per acre when properly irrigated.

The concluding paper, by Mr. J. H. Ronaldson, dealt with the copper deposits of Little Namaqualand. The author pointed out that from the very early days it had been known that this district in the extreme west of Cape Colony, lying just south of the Orange River, and bounded on the west by the Atlantic Ocean, was a copper-producing one. As early as 1685 one of the Dutch governors dispatched a party to explore the country, but it was not until 1855 that successful work was begun. The district in which the copper mines are situated lies in the hilly ground about 50 miles from the coast, and is connected with Port Nolloth by a 2 feet 6 inches narrow-gauge railway, the property of the Cape Copper Co. During the year 1904 about 85,000 tons of ore were raised, the percentage of copper ranging from 26 per cent. to as low as 3·6 per cent.

T. H. B.

ANTHROPOLOGY AT THE BRITISH ASSOCIATION.

THE South African meeting will long be memorable to members who are especially associated with Section H, not so much on account of the high quality and interest of the papers read (though, as will be seen, these were often of considerable importance) as because it afforded an opportunity of examining, measuring, and photographing specimens of the native races, and (what was still more valuable) of visiting Bantu kraals, seeing the native in his ordinary surroundings, and witnessing some of his ceremonial rejoicings. These visits and investigations were outside the strictly sectional work, and can hardly be detailed here; but they cannot fail of permanent results in an increased comprehension of the conditions of native life and of the great problems, scientific, social, and political, connected with the native peoples of South Africa, by all who were privileged to take part in them.

Dr. Haddon's presidential address, delivered on August 16 at Cape Town, has already been printed in full in NATURE (September 7, p. 471), and need not be further referred to here than to point out its exceptionally comprehensive and useful character as a summary of our present information as to the process by which South Africa was peopled, and a sane, earnest, and timely appeal for scientific study on the spot of peoples, some of which are actually vanishing before our eyes, and the others of which are undergoing at the hands of the white race a process of so-called civilisation which will issue in a few years in the total destruction of their ancient institutions and beliefs.

The first paper read was by Mr. E. Sidney Hartland on the totemism of the Bantu. He pointed out that to the French Protestant missionary Casalis belongs the honour of being the first to note the similarity between the totemic practices and belief of the North American Indians and those of the Bantu peoples. The object of the paper was to examine the latter practices and belief, so far as they have been recorded, with the view of ascertaining how far they extend and what evidence there is of their former existence where they are no longer preserved; whether there is any essential difference between the practices and belief of the Bantu and what is generally understood by totemism elsewhere; and lastly, the process of decay. The conclusions arrived at were that, though there is little in what is recorded of the Bantu on the western side of the continent down to the southern boundary of Angola which points directly to totemism, there is sufficient to suggest that it once generally prevailed there, and that its disappearance is due to contact with the Negro; that with regard to the eastern and northern Bantu there can be no doubt about the prevalence of totemism which, though now in decay, corresponded in all essential particulars to that of other races, such as the North American Indians and the Australians; and that its decay was due to the change in the reckoning of kinship from reckoning through the mother only to reckoning through the father only, and to the ancestor-worship which had arisen upon the new social basis thereby laid.

Mr. L. Peringuey, curator of the South African Museum, followed with an address on the Stone age in South Africa. The substance of this address has been published in the volume entitled "Science in South Africa." It was illustrated by a carefully selected series of specimens from the museum, which were examined with interest in the course of an indecisive discussion which followed.

The session on Thursday, August 17, was opened by Mr. Henry Balfour with a paper on the musical instruments of South Africa. Mr. Balfour is already known as an authority on the evolution of the musical bow. In the bow of the Damaras, which is upon occasion temporarily converted into a musical instrument, he recognised an example of the earliest stage of development of a long series of instruments culminating in various forms of the harp. Other types of musical instruments were discussed, of which the most interesting, as well as the most enigmatical, was the *goura* of the Bushmen, an instrument substantially identical with the *iseba* (or *lesiba*) of the Basuto and some other Bantu tribes. On this instrument the writer had little to add to what he had previously published in the *Journal of the Anthropological Institute.* Generally as to the development of musical instruments, stress was laid on the importance of exact information with the view of determining the geographical distribution and evolution of the various types.

Miss B. Bullen-Burry read a paper discussing the social and political questions raised in the United States by the existence of the Negro in the midst of a white population. This paper dealt with an aspect of ethnology rarely brought before the section; but the state of things described by the writer and the problems involved are so similar to those even more critical in character now engaging the attention of politicians in South Africa, and on the satisfactory solution of which depends the future of the country, that it is much to be regretted that the writer had so small an audience.

On Friday, August 18, Prof. von Luschan read a paper on artificial deformation in Africa, abundantly illustrated by lantern slides. He traced all deformations of the human body to a foreign source, except possibly the tattooing in relief and the deformations of the lips.

The Rev. Canon Crisp presented a paper (which was read by the Rev. J. S. Moffat) on the mental characteristics of the Bechuana. He dwelt on the peculiarities of Sechuana grammar and construction, illustrating them by various examples. The Bantu languages will express any idea, however esoteric, and will do it with extraordinary precision and often with great felicity. A foreigner who has acquired one of them will often leave his own language to use a Bantu word, because it conveys his thought more aptly and tersely. Bantu proverbs and metaphors are often most incisive, emphasising with much power and delicacy what it is intended to say. The Bechuana are accustomed to use their proverbs without any introduction, their rapidity of thought enabling both speaker and hearers at once to locate the idea to be conveyed. They are masters in the art of destructive criticism, and their native shrewdness, observation, and wit render them dangerous disputants. Instances of the facility with which Bantu acquire European learning and adapt themselves to European thought were given. This paper aroused much interest on the part of the over-sea members who heard it, and numerous questions on details were addressed to Canon Crisp, though of discussion strictly speaking there was none.

A short paper by Mr. William Grant was read giving an account of a visit in March, 1894, to Magato, the then chief of the Mawenda in the Transvaal. The business of the Cape Town meeting was then closed by the president with a few appropriate words of appreciation of the assistance rendered by Mr. Peringuey, who had kindly acted as local secretary, and of the kindness with which the visitors from the Mother Country had been received.

The session at Johannesburg was opened on Tuesday, August 29, with a paper by Dr. S. Schönland, on arts and crafts among the natives of South Africa, containing a summary of present knowledge on the subject.

A paper followed by Mr. W. A. Squire on the art of the Bushmen. It was illustrated by the exhibition of copies of a number of Bushman drawings, on which the author